

Deformation of the Ancestral California Forearc during Late Cretaceous–Early Tertiary Blueschist Exhumation, Mount Diablo Region

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Late Cenozoic growth of Mt. Diablo anticline has produced unique 3D exposures of stratigraphic relationships and normal faults that record late Cretaceous uplift and early Tertiary extension in the ancestral California forearc basin. Several of the early Tertiary normal faults on the northeast flank of Mt. Diablo have been traced northward in the subsurface and correlated with structures that accommodated Paleogene subsidence of the now-buried Rio Vista basin. Stepwise restoration of Mt. Diablo anticline reveals that the normal faults probably root into the “Mt. Diablo fault”, a structure that juxtaposes blueschist-facies rocks of the Franciscan complex with relatively unmetamorphosed marine forearc sediments, and which is probably the local equivalent to the Coast Range fault. Apatite fission-track analyses indicate that the Franciscan rocks at Mt. Diablo were exhumed and cooled from depths of 20–30 km in the subduction zone during extension of the overlying forearc crust. Angular unconformities in the Cretaceous and Paleogene sections on the northeast side of Mt. Diablo, and in the Rio Vista basin to the north, indicate that that wholesale uplift and eastward tilting of the western forearc basin also occurred during blueschist exhumation. Previous workers have recognized the structural relief associated with this uplift and tilting, as well as the appearance of Franciscan detritus in late Cretaceous and early Tertiary strata indicating the presence of an emergent Franciscan highland bordering the forearc basin to the west. The stratigraphic and structural relations exposed at Mt. Diablo support models for exposure of Franciscan blueschists through syn-subduction extension and attenuation of the overlying forearc crust, accompanied by (local?) uplift and erosion of the accretionary prism.

Biography: Jeff Unruh is President of Lettis Consultants International, Inc., a consulting firm headquartered in Concord that specializes in engineering geology and seismic hazard analysis. Unruh got his B.S. (1985) and Ph.D. (1990) degrees at UC Davis, and has been with LCI since it was founded in 2011. Previously he worked with Fugro Consultants and William Lettis & Associates, Inc. Unruh’s primary areas of expertise are structural geology and neotectonics. Current projects include an update of the seismic hazard model for Idaho National Laboratory, and analysis of land subsidence in the San Joaquin Valley for the California Department of Water Resources. Unruh held a courtesy appointment as a Research Geologist at UC Davis from 1994–2015, and he is a Fellow of the Geological Society of America.